MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

ETM7206 – SPECIAL TOPICS ON EMERGING TECHNOLOGIES & STANDARDS

(All sections / Groups)

2 JUNE 2016
8.00 p.m. – 11.00 p.m.
(3 Hours)

INSTRUCTION TO STUDENT

1.This question paper consists of 5 pages including the cover page with 4 questions only.

2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please print all your answers in the answer Booklet provided.

Question 1

(a) In advanced wireless communication systems, telecommunication management plays an important role in improving the signal quality. Explain TWO (2) management challenges.

[5 marks]

(b) Trend of telecommunication is important in emerging wireless technologies. Identify and describe THREE (3) trends in evolution of telecommunication.

[6 marks]

(c) Describe the 3G system capabilities in the evolution of telecommunication.

[7 marks]

(d) Figure Q1 shows the average (per client) throughput performance experienced by IEEE 802.11b clients within a single cell from a simulation study. In the simulation, all clients except one transmit at 11Mbps. The exceptional client transmits at 1Mbps, 2Mbps, 5.5Mbps or 11Mbps, corresponding to the four curves in Figure Q1. From the figure,

(i) Make an observation regarding the performance of multi-rate support.

[3 marks]

(ii) Discuss the causes of the performance trend observed.

[4 marks]

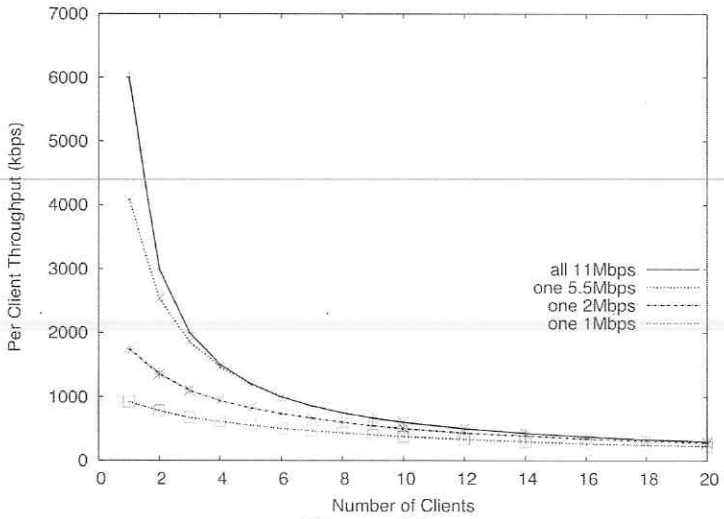

Figure Q1

Continues...

Question 2

(a) Draw a diagram to show a comparison between Universal Mobile Telecommunications System (UMTS) 3G and Long Term Evolution (LTE) 4G network architecture.

[8 Marks]

(b) Consider the LTE system deployed in Malaysia.

(i) Consider a mobile subscriber who is currently watching a video clip from www.youtube.com over an LTE connection. Discuss what will happen when a voice call intended to the subscriber reaches his/her device. Explain your answer.

[5 Marks]

(ii) Discuss what has to be done in order to avoid the above situation.

[3 Marks]

(c) Modulation is the process of varying one or more properties of a carrier signal, with a modulating signal that typically contains information to be transmitted. Figure Q2 shows the performance of different modulation schemes for 2 different code rate which are common code and common typical code in Long Term Evolution (LTE). From the figure, make an observation regarding the performance of different order of modulation scheme. Then, discuss the causes of the performance trend observed.
[*Note: CNR: carrier to noise ratio, QPSK: Quadrature phase shift keyin, QAM: Quadrature amplitude modulation*]

[4 marks]

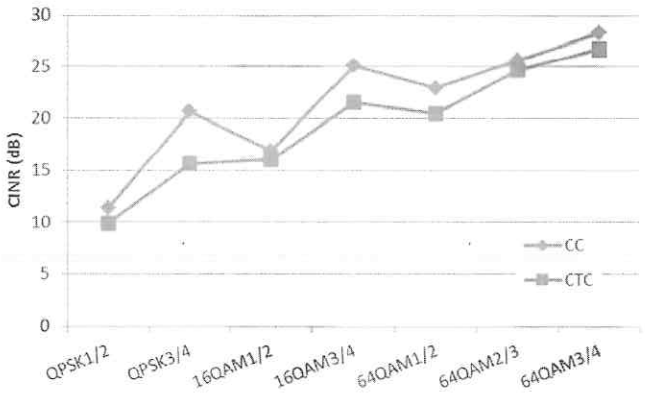

Figure Q2

(d) Provide FIVE(5) benefits of implementing 5G technologies in wireless communication system.

[5 marks]

Continues...

Question 3

(a) Discuss the I, P, and B frames used in MPEG video coding. Explain why I-frames are inserted into the compressed output stream relatively frequently.

[8 marks]

(b) You are given two digital video sequences, one of them was digitized using 4:4:4 format while the other one was digitized using 4:2:2 format. Discuss the quality difference between the two video sequences.

[3 marks]

(c) For each of the following features of human visual system (HVS), suggest how they can be exploited in designing a digital video coder.

(i). HVS is more sensitive to luminance detail than to colour detail
(ii). HVS is more sensitive to high contast than low contrast
(iii). HVS is more sensitive to low spatial frequencies than high spatial frequencies
(iv). The illusion of "smooth" motion can be achieved by presenting a series of images at a rate of 20-30 Hz or more.
(v). HVS responses vary from individual to individual

[5 marks]

(d) Determine the number of bits required to encode the stream "STRESSED" with the following Huffman code. How does it compare with a 3-bit fixed-length coding?

Symbol	Probabilities	Huffman Code
S	0.3	11
T	0.2	01
R	0.1	000
D	0.1	001
E	0.3	10

[3 marks]

(e) Assume that the digitized video in PAL format is to be compressed using the MPEG-1 standard with a frame sequence of:

IBBPBBPBBPBBI

and average compression ratios of 10:1, 50:1 and 20:1 for the I-frame, B-frame, and P-frame, respectively. Also assume that for PAL, the luminance signal is sampled at the spatial resolution of 352x288 and that the two chrominance signals are sampled at half of this resolution. The refresh rate for PAL is 25Hz. Calculate the data rate of the video stream.

[6 marks]

Continues...

Question 4

(a) Discuss the four components for streaming architecture.

[6 marks]

(b) Explain the Internet Protocol Television (IPTV) system. Discuss the three main features of IPTV.

[6 marks]

(c) One of the methods under the transport level error control techniques is the Unequal Error Protection (UEP). UEP can be utilized using both Forward Error Correction (FEC) codes as well as hierarchical modulation. It can be classified into three categories according to the consideration of different aspects (binary bits, frames and layers). Explain how UEP is used in regards to the following:

(i). FEC codes.
(ii). Hierarchical modulation.
(iii). Different importance of binary bits in a video bit-stream.
(iv). Different importance of frames in a GOP.
(v). Different importance of layers in scalable video coding

Use diagrams where necessary.

[10 marks]

(d) With proper error-resilience tools, packet loss typically leads to the loss of an isolated segment of a frame. The lost region can be "recovered" using error concealment technique at the decoder. Explain the concept of error concealment in video transmission.

[3 marks]

End of Paper